

# PATENT COOPERATION TREATY

TRANSLATION

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing  
(day/month/year)

Applicant's or agent's file reference

**PC-9631**

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

**PCT/JP2005/011135**

International filing date (day/month/year)

**17.06.2005**

Priority date (day/month/year)

**23.06.2004**

International Patent Classification (IPC) or both national classification and IPC

Applicant

**NIPPON TELEGRAPH AND TELEPHONE CORPORATION**

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/JP

Authorized officer

Facsimile No.

Telephone No.

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Box No. I

Basis of this opinion

1. With regard to the language, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.  
☐ This opinion has been established on the basis of a translation from the original language into the following language  
\_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (under Rule 12.3 and 23.1(b)).
2. With regard to any nucleotide and/or amino acid sequence disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material  
☐ a sequence listing  
☐ table(s) related to the sequence listing
  - b. format of material  
☐ in written format  
☐ in computer readable form
  - c. time of filing/furnishing  
☐ contained in the international application as filed.  
☐ filed together with the international application in computer readable form.  
☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-17</u>	YES
	Claims		NO
Inventive step (IS)	Claims	<u>17</u>	YES
	Claims	<u>1-16</u>	NO
Industrial applicability (IA)	Claims	<u>1-17</u>	YES
	Claims		NO

2. Citations and explanations:

Document 1: JP 2001-27770 A (Alcatel), 30 October 2001,  
claims, paragraphs 0011, 0015, 0027, Figs. 1-4  
& EP 1059747 A1 & FR 2796783 A  
& AU 3796300 A & CN 1279549 A  
& CA 2309789 A1

Document 2: Koji MASUDA, et al., "Enkaku Reiki EDF/DRA Hybrid-senkei Chukey  
Hoshiki o Mochiita L-tai 1.28 Tbit/s (32x43 Gbit/s), 528km (6x88km) DSF no Field  
Jikken", The Institute of Electronics, Information and Communication Engineers Gijutsu  
Kenkyu Hokoku, 16 April 2004,  
Vol. 104, No. 25, pages 27-32

Document 3: JP 2001-343673 A (Lucent Technologies Inc.), 14 December 2001, full text,  
all drawings  
& US 2001/0036347 A1

& EP 1130825 A1 & CA 2335891 A1  
Document 4: JP 2001-102666 A (Fujitsu Ltd.),  
13 April 2001, paragraphs 0030-0032, Fig. 3  
& US 6882466 B & EP 1091509 A1

Document 5: JP 2003-57692 A (Sumitomo Electric Industries, Ltd.),  
26 February 2003, full text, all drawings  
& US 2002/018456 A1 & EP 1265381 A1

Document 6: JP 2002-280652 A (The Furukawa Electric Co., Ltd.),  
27 September 2002, paragraphs 0010-0012

The inventions of claims 1, 15, and 16 do not appear to involve an inventive step based on document 1. Document 1 pertains to an optical fiber communication system, and describes making the difference between the shortest wavelength of the exciting light wavelength and the signal light wavelength be 10-15 THz. In the optical fiber communication system described in document 1, making the difference between the shortest wavelength of the exciting light wavelength and the signal light wavelength be 15 THz, making the signal light a wavelength on the longer wavelength side of the zero dispersion wavelength of the silica fiber, and using it in an urban installation and for a central light amplifier as fiber all would be obvious to a person skilled in the art.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: Box V

The inventions of claims 2-5 do not appear to involve an inventive step based on document 1 and document 2. Document 1 describes performing C-band amplification. Document 2 describes performing L-band amplification, using dispersion shift fiber as silica fiber, and using a remotely excited double pass type EFD module or a remotely excited single pass type EDF module. Employing the art described in document 2 in the optical fiber communication system described in document 1 would be easy for a person skilled in the art. Using non-zero dispersion shift fiber instead of dispersion shift fiber and making the exciting light wavelength 1430 nm to 1470 nm and 1440 nm to 1470 nm are matters that can be appropriately achieved by a person skilled in the art.

The invention of claim 6 does not appear to involve an inventive step based on document 1 and document 2. Employing the art described in document 2 in the optical fiber communication system described in document 1 and using an FBG laser diode type or fiber laser type as an exciting light source would be easy for a person skilled in the art.

The inventions of claims 7-11 do not appear to involve an inventive step based on documents 1, 2, and 3. Document 3 pertains to an optical fiber communication system that uses Raman amplification, and describes making the zero dispersion wavelength ( $\lambda_0$ ) a value offset from the average value of excitation wavelength ( $\lambda_p$ ) and signal light wavelength ( $\lambda_s$ ). Employing the art described in document 3 in the optical fiber communication system described in document 1 and making the exciting light source a plurality of exciting light sources with width 10 nm or less, and constituting it to satisfy  $2\lambda_0 - \lambda_s > \lambda_p$ ,  $2\lambda_0 - \lambda_s > \lambda_p + 10$ , and  $2\lambda_0 - \lambda_s > \lambda_p + 15$ , and making the exciting light source an FBG laser diode type or FP laser diode type or fiber Raman laser type, and making it possible to adjust the output of each polarized/multiplexed FP laser diode all would be easy for a person skilled in the art.

The inventions of claims 12 and 13 do not appear to involve an inventive step based on documents 1, 2, and 4. Document 2 describes art that uses a combination of a Raman amplifier and an erbium-doped optical fiber amplifier. Also, document 4 pertains to an erbium-doped optical fiber amplifier, and says it is possible to control gain by adjusting the inversion distribution. Employing the art described in document 2 or the art described in document 4 in the optical fiber communication system described in document 1 and making a constitution provided with a gain-equalized optical fiber would be easy for a person skilled in the art. The upper level occupation percent of the erbium-doped fiber is a matter that can be appropriately achieved by a person skilled in the art.

The invention of claim 14 does not appear to involve an inventive step based on documents 1 and 2. Adjusting the signal light power spectrum after considering the gain spectrum in Raman amplification would be obvious to a person skilled in the art.

What is described in claim 17, that is, using a single signal light wavelength and making the difference between the longest wavelength of the exciting light wavelength and the signal light wavelength be 15.6 THz or higher is not described in any of documents 1-6 cited in the ISR and is not obvious to a person skilled in the art.